

**UAS DJI Phantom 4
RTK**

**Newtongrange,
Dalkeith, Midlothian**

2 December 2020

Accident

Investigation Synopsis

The UAS, a DJI Phantom 4 RTK, was being operated in an automated flight mode to survey a railway track and surrounding infrastructure when one of the four propellers detached whilst in-flight. The aircraft rapidly descended from a height of 70 m (230 ft) where it struck the ground in the rear garden of a house. No persons were injured.

This investigation has reviewed the new UAS regulations introduced on 31 December 2020 concerning the safe overflight of people and data available to assist in risk assessments. Two Safety Recommendations are made to the UK CAA.

Safety Recommendation 2021-023

Justification

Neither the operator in its risk assessment, nor the CAA in UKPDRA01, based mitigating actions on data published for UAS failure rates per flying hour. Whilst it is recognised that UAS manufacturers would be understandably reluctant to publish such information, large operators such as Network Rail are collating aircraft usage data, and UK operators are also now required to record usage data for each aircraft in addition to individual pilot flight hours to support annual applications to the CAA for the renewal of an operational authorisation. Collation and dissemination of such data would enable, in particular for operations involving overflight of people, the actual risk to uninvolved persons on the ground to be assessed with greater accuracy.

Therefore, the following safety recommendation was made:

Safety Recommendation 2021-023

It is recommended that the Civil Aviation Authority collate up to date information regarding the failure rates per flying hour for unmanned aircraft systems operating in the Specific category, or previously under a CAA Permission for Commercial Operations, to facilitate effective risk assessments.

Date Safety Recommendation made: 13 May 2021

LATEST RESPONSE

Response received: 28 October 2022

The requirement to gather flying hours data from both Open category and Specific category operations has been considered and the following position adopted:

Open Category:

The requirement for Open category UAS Operators to record flying hours as part of the annual Drone Model Aircraft Registration and Education Service (DMARES) will be encouraged, but not mandated; this would require regulatory change. DMARES is currently undergoing an extensive update programme, including moving to a new host platform, which is not expected to be complete until Q4/23 - Q1/24. Once successfully transitioned, the CAA Intelligence Team will be tasked to monitor failure rates based upon 'hours flown' and

Mandatory Occurrence Reports (MORs).

Specific Category:

We will expand upon our privilege, under UK Reg (EU) 2019/947 UAS.SPEC.090, whereby any holder of an Operational Authorisation (OA) must make records available to the CAA upon request. As such, we will now start to collect 'hours flown' data for Specific category operations. New Acceptable Means of Compliance and Guidance Material is to be published in Q4/22 and includes a requirement for Specific category UAS Operators to establish and maintain a Flying Logbook and a separate Technical Logbook for each aircraft. Specific category UAS Operators already provide data to confirm that they have conducted a minimum of two flying hours in the last three months via their OA. This measure is an expansion upon that requirement and should enhance safety analysis, validate MOR data and assist a Market Surveillance Authority when compared against aircraft type, though some standardisation may be required.

As previously stated, it should be noted that an OA is typically valid for a year and that there is no obligation on the applicant to renew if they decide to cease operating. This means that following the issuance of an OA, unless Performance Based Oversight (PBO) principles means there is a requirement identified to audit or examine the applicant, the CAA may have no further contact with them.

If required, a further update can be provided by 31 December 2023.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

Action Status **Planned Action Completed**

Feedback rationale

(EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

Response received: 28 July 2021

The CAA partially accepts this recommendation. Most flying hours accumulated by smaller commercial off-the-shelf UAS in the UK are carried out in the Open Category, which the CAA does not have visibility of. The CAA accepts that Open Category products like this will be used under an Operational Authorisation (OA) in the Specific Category. Regulation (EU) No. 2019/945 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018 requires that the Secretary of State nominates a Market Surveillance Authority (MSA) that will have responsibility for ensuring that manufacturers adhere to appropriate standards.

Part of the remit under UK Reg (EU) 2019/945 is that the MSA will engage with the CAA on safety matters and help ensure that products are suitably safe for market and use in the UK. This coupled with the C-marking standards defined in the regulation will assist in ensuring that equipment used in the UK is of high quality, and the MSA will assist in ensuring that manufacturers continually improve their products.

The collation of all flying hours across multiple product lines and manufacturers will not be feasible. The collection of hours flown by type in the Specific Category is difficult due to the temporary nature of many applications. An Operational Authorisation is typically valid for a year, and there is no compulsion on the applicant to renew. This means that following the issue of the OA, unless Performance Based Oversight (PBO) principles means there is a requirement identified to audit or examine the applicant, the CAA may have no further contact with them. The provision of full logs is not currently a requirement under any existing

legislation; only a confirmation of currency within the 3 months preceding the application or renewal.

Under UK Reg (EU) 2019/947, point UAS.SPEC.090, any holder of an Operational Authorisation must make any records available to the CAA on request. The CAA will examine whether the application and audit processes could be expanded to use this privilege to retain logs by aircraft type at the point of renewal or expiry of a Specific Cat OA.

AAIB Assessment – Partially Adequate Open

(SRIS Reference:)

Safety Recommendation 2021-024

Justification

Since 2015, 73 accidents involving UAS aircraft have been reported to the AAIB where a loss of control occurred, of which 69 had a MTOM of less than 25 kg. It is unclear if the current mitigations intended to prevent injury to uninvolved persons are adequate or that it has been due to chance that a person has not been injured.

This investigation indicates that UAS operations in the Specific category pose a risk to uninvolved people on the ground being struck by an aircraft relying solely upon its propulsion system for lift, following a failure of that propulsion system.

Therefore, the following safety recommendation was made:

Safety Recommendation 2021-024

It is recommended that, until an analysis of failure rates per flying hour has demonstrated an acceptable level of safety, the Civil Aviation Authority should consider prohibiting the overflight of uninvolved persons for those unmanned aircraft operating in the Specific category which rely solely upon their propulsion system for lift that would, following a failure of the propulsion system, impact the ground with a kinetic energy exceeding 80 Joules.

Date Safety Recommendation made: 13 May 2021

LATEST RESPONSE

Response received: 28 July 2021

The ability to conduct a root cause analysis of the accident was frustrated by the rapid dispatch of the aircraft to the manufacturer for repair; important safety conclusions may have been missed. Neither Regulation (EU) No 376/2014 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018, nor CAP722 specifically inform reporters that they should retain any material from the accident for potential investigations. The CAA will consider what advice should be added to a future draft of CAP722 regarding the preservation of evidence once suitable lines to take have been agreed with AAIB.

Overflight of people is permitted by regulation under UK Reg (EU) 2019/947. The CAA has not seen enough evidence that indicates that the prohibition of overflight of uninvolved people is a proportionate response to this accident. Authorisations to fly in congested areas have operating conditions and require a higher level of remote pilot competence to mitigate the safety risk it presents.

The CAA will conduct a trend analysis of occurrence reporting and will release an appropriate message to the regulated community to reinforce good practice on how to reattach propellers and remind operators to conduct root cause analysis to close MORs.

Safety Recommendation Status Closed

AAIB Assessment Adequate

Action Status Planned Action Completed

Feedback rationale

Although the cause of the loss of the propeller in this accident was not determined, the focus of Safety Recommendation 2021-024 is on the consequences of failures occurring to some types of UAS operating in the Specific category regardless of their cause. The CAA has considered the issue of overflight of uninvolved persons for these particular types of UAS but, in its response, has stated that the Authority has not seen enough evidence to warrant taking action.

The AAIB notes the CAA's intention to update CAP722 to regarding the preservation of evidence following an accident, which, if implemented, could enable the CAA, in conjunction with the Market Surveillance Authority (Safety Recommendation 2021-023 refers), to more effectively target specific areas of UAS design and operations to enhance safety. (EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

N/A

(SRIS Reference:)